

MR. DANIEL ADAMSON.

AS a mechanical engineer and a metallurgist, Mr. Daniel Adamson must always maintain a foremost place, for he was in the van in the industrial progress of the century. He was born at Shildon, in the county of Durham, in 1818, and apprenticed to Mr. T. Hackworth, locomotive superintendent of the Stockton and Darlington Railway, with whom he remained from 1835 to 1841. He then held various stations in the same railway until 1850, and in 1851 he began business on his own account as an iron-founder, engineer, and boiler-maker.

From this time forward until quite recently Mr. Adamson has brought out many highly successful inventions in connection with the manufacture of boilers and the application of steam. The first of these was a flange seam for high-pressure boilers, patented by him in 1852, and well known as Adamson's flange seam. In 1856, Mr., now Sir Henry, Bessemer, read a paper before the British Association at Cheltenham describing his steel process, and one of the first to apply it was Mr. Adamson. Having satisfied himself by experimental trials of the quality of steel, he determined to use it for the manufacture of boilers; and Sir Henry Bessemer, when on May 9, 1888, he presented the Bessemer Medal to Mr. Adamson on behalf of the Council of the Iron and Steel Institute, referred with satisfaction to this circumstance, as being the turning-point in his own career, and as having given a start to the use of steel for general engineering purposes. Later on, when open-hearth steel was introduced by the late Sir William Siemens, Mr. Adamson made trial of it for boiler use, and was for years an upholder of the merits of steel. He wrote a comprehensive paper "On the Mechanical and other Properties of Iron and Mild Steel," which was brought before the Paris meeting of the Iron and Steel Institute in 1878, when it gave rise to a most interesting discussion. This paper is looked upon as a standard one on the subject of steel.

Mr. Adamson's inventions appear to have been all intimately connected with his business. In 1858 he applied hydraulic power for the riveting of steel structures, and in 1862 he brought out an invention for building steam boilers, the rivet holes being drilled through the plates when these were in position. He was entirely opposed to the punching of steel plates; he described it as a barbarous mode of treatment, as it tore the fibre of the material; and he would never allow it to be used in his own works. The important feature in all Mr. Adamson's work was its thoroughness; all the material used was subjected to chemical and mechanical tests, so that he obtained a reputation throughout the world for the soundness of everything he turned out.

Mr. Adamson was one of the first to show the superiority of compound engines. This class of engine had already been introduced by Mr. John Elder, of Glasgow, but to Mr. Adamson is greatly due the credit of the employment of triple and quadruple expansion engines. In 1874 he read a paper at Manchester, in which he maintained that pressures of 150 pounds on the square inch could be as safely applied as pressures of 50 pounds by a careful extension of the compound system. As far back as 1861 he patented and brought out a triple-expansion engine, and in 1873 a quadruple engine. In the paper to which we have just referred Mr. Adamson gave expression to the opinion that the consumption of coal per horse-power per hour should not exceed from 1 to $1\frac{1}{2}$ pounds of coal, whilst at that time $2\frac{1}{2}$ pounds per horse-power per hour was considered a very good result.

Besides these inventions, Mr. Adamson took out patents in connection with the manufacture of steel by the Bessemer process, with machinery for compressing steel, and for testing machines, as also improvements in guns and armour.

No account of his work would be complete without a reference to his connection with the Manchester Ship Canal. He was of an enthusiastic temperament, and this was made specially evident in connection with this great undertaking. A Manchester man, and thoroughly convinced of the benefit which would accrue to the surrounding manufacturing towns, Mr. Adamson set to work to effect what others had proposed. It is more than 65 years ago since it was proposed that Manchester should be connected with the sea by a ship canal, but it was Mr. Adamson's invitation to various persons to meet at his house on June 27, 1882, that really started the project. The proceedings then initiated resulted in the incorporation of the Manchester Ship Canal Company in 1885. Mr. Adamson's work in connection with international progress, and his labours to make Manchester an ocean steam port, will not readily be forgotten.

In September and October last he was engaged on an examination of the iron mines of the island of Elba, and he embodied the results in a report to the Italian Government. About two months ago he caught a cold on his Flintshire estate of Wepre Hall. He returned to his home at Didsbury, and died there on Monday, the 13th inst.

Quite recently Mr. Adamson was elected President of the Iron and Steel Institute. He was a member of the Institution of Civil Engineers, of the Institution of Mechanical Engineers, and of the Iron and Steel Institute, and to the proceedings of these Societies he presented many papers containing the results of his inquiries as to the properties and treatment of metals, especially iron and steel.

NOTES.

AT a meeting of a Committee appointed by the Council of the Royal Society to set on foot a memorial to the late James Prescott Joule, held on November 30 last, at Burlington House, it was unanimously resolved that a fund should be raised for a memorial of an international character commemorative of the life-work of Joule. This memorial will have for its object the encouragement of research in physical science. It is proposed also that a tablet or bust shall be erected to his memory in London, a Manchester Memorial Committee having already taken steps to ensure a suitable monument in his native city. Joule's discoveries were of such commanding importance that there can be no doubt as to the success of this movement. The Committee feel confident not only that men of science will gladly contribute towards a fund to do honour to Joule's memory, and to assist others to follow in his footsteps, but that those who devote themselves to the practical application of scientific principles will also be anxious to aid in the promotion of a fitting memorial of one whose work has exerted so great an influence on industry.

WE regret to announce the death of Gustave-Adolphe Hirn, the eminent physicist. He died at Colmar on January 14, in his seventy-fifth year.

MR. ROONEY, who accompanied the late Father Perry on the solar eclipse expedition to the Salut Isles, has arrived in England, bringing with him the plates successfully exposed during the totality of the eclipse by Father Perry and himself. Mr. Rooney has put himself in communication with the Astronomer Royal, and the plates will be handed over to the Royal Astronomical Society to be developed.

THE Forth Bridge was tested by the engineers on Tuesday as a preliminary to the passage of the first train over it on Friday. The following is the official report:—"Sir John Fowler and Mr.

Baker, engineers of the Forth Bridge, have to-day tested the two 1700-foot spans by placing on the centres two trains, each made up of 50 loaded coal waggons and three of the heaviest engines and tenders, the total load thus massed upon the spans being the enormous weight of 1800 tons, which is more than double what the bridge will ever be called upon in practice to sustain. The observed deflections were in exact accordance with the calculations of the engineers, and the bridge exhibited exceptional stiffness in all directions." Every part of the bridge will be in perfect order for the visit of the Prince of Wales on March 4.

AT the meeting of the Convocation of London University, on Tuesday, there was some discussion as to the question of the re-constitution of the University. Dr. F. J. Wood, who presided, said he was not in a position to help Convocation very much. As they were well aware, the Senate had drawn up a scheme which was intended to follow on the lines of the recommendations of the Royal Commission. That scheme had been submitted to the consideration of University College and King's College, and up to now those Colleges had arrived at no decision upon it, but requested a conference. That conference was about to take place, and, of course, until it was held it was impossible for any of them to say what shape the scheme would ultimately assume. Mr. T. Tyler moved a resolution declaring that "The proposal of the University for London Commission that, under a new charter for this University, special powers and privileges should be conferred on certain institutions in or near London is incompatible with the fair and just treatment of the provincial Colleges, and that the acceptance of this proposal would be detrimental alike to the interests of the provincial Colleges and to those of the University itself." This motion was unanimously adopted.

ON Friday, January 24, at 4.30 p.m., Mr. Holland Crompton will begin a course of ten lectures at the Central Institution, Exhibition Road, on the theory of electrolysis and the nature of chemical change in solution. In this course an historical account will be given of the recent development of the Clausius dissociation hypothesis by Arrhenius, Ostwald, and others; of van't Hoff's extension of Avogadro's theorem to dilute solutions; and of the Raoult methods of determining the molecular weights of dissolved substances. On Monday, January 27, at 4.30 p.m., Prof. Armstrong, F.R.S., will begin a special course of ten lectures on methods of analysis as applied to the determination of the structure of carbon compounds. The object of this course will be to explain and experimentally demonstrate the methods adopted in determining the structure of the more important and typical compounds, including alkaloids, carbohydrates, and oils and fats.

THE annual meeting of the Association for the Improvement of Geometrical Teaching was held last Friday morning in one of the theatres of University College, London, under the presidency of Prof. Minchin. While observing with pleasure that the Universities of Oxford and Cambridge had embodied in the printed regulations for various examinations some requests of the Association with regard to elementary geometry, the Council in their report expressed regret that the Euclid papers set for responsions at Oxford still consist exclusively of "book work." The response of the University of Dublin to the Society's petition is that they are not prepared to decide on such important questions without much consideration. At the afternoon meeting papers were read by the Master of St. John's College, Cambridge, on a new treatment of the hyperbole; by Mr. G. Heppel, on the teaching of trigonometry; by Mr. E. M. Langley, on some geometrical theorems; by Prof. Minchin, on statics and geometry; and by Mr. R. Tucker, on isosceles hexagrams.

FEARS having been expressed as to a possible connection between influenza and cholera epidemics, Dr. Smolenski publishes, in the Russian *Official Messenger*, an elaborate report upon the subject. He points out that the suspicion is not new, and that in 1837 it was discussed by Gluge ("Die Influenza"), and refuted. In fact, influenza or *grippe* epidemics have been known in Europe since 1173—that is, for more than seven hundred years; whilst the first cholera epidemic appeared in Europe in 1823, but did not spread, that time, further than Astrakhan. Six years later it broke out in Orenburg; next year in Caucasia and Astrakhan again, whence it spread over Russia, and, in 1831, reached Western Europe. As a rule, influenza spreads very rapidly, and in 1782, at St. Petersburg, no fewer than 40,000 persons fell ill of it on the same day (January 14). In 1833 its progress was also very rapid, and within a few days it appeared at places so far apart as Moscow, Odessa, Alexandria, and Paris, while cholera epidemics are usually slow in their migrations from one place to another. Moreover, influenza is chiefly a winter epidemic, while cholera prefers the spring and the summer. Dr. Smolenski has further tabulated all influenza and cholera epidemics which have broken out in the course of our century in Europe, and he comes to the following results:—Influenza broke out in 1816, in Iceland; 1827, in Russia and Siberia; 1830–33, in Europe generally; 1836–37, in Europe; 1838, in Iceland; 1841–48 and 1850–51, in Europe; 1853, in the Faroe Islands; 1854–55 and 1857–58, in Europe; 1856, in Iceland and the Faroe Islands; 1862, Holland and Spain; 1863–64, France and Switzerland; 1866, France and Great Britain; 1867, France, Germany, and Belgium; 1868, Turkey; and 1874–75, Western Europe. As to the cholera epidemics during the same period they were: 1823, Astrakhan and Caucasia (from Persia); 1829, Orenburg (from Turkestan); 1830, Russia (from Persia); 1831–37, various parts of Europe; the next epidemic appeared in 1846 in Transcaucasia (coming from Persia); in 1847 it spread over Siberia and Russia, and in 1848 it was in Europe; in 1849–52 it was followed by feeble outbreaks all over Europe. The third cholera epidemic came from Persia again in 1852, and it resulted in a severe outbreak during the years 1853–55, in Europe, followed by feebler outbreaks till 1861. The fourth cholera epidemic came through the Mediterranean ports in 1865, and lasted in Europe till 1868, with feebler epidemics in 1869–74. The latest invasion of cholera was in 1884, when it came again through the Mediterranean ports. As to the cholera epidemic which now begins to die out in Persia and Mesopotamia, it certainly is a danger—the more so as, out of the five epidemics of cholera which have visited Europe, three have come from Persia.

ATTENTION has lately been called to the fact that anchovies are found off Torquay and other south coast fishing centres. Prof. Ewart, of Edinburgh, has written to the *Times* that during the present winter they have made their appearance in the Moray Firth. At the end of December they were abundant off Troup Head, where considerable numbers were captured in the herring nets by the Buckie fishermen. Prof. Ewart thinks that further inquiries may perhaps show that the northward migration of the anchovies is in some way related to the mildness of the winter. He points out that it is most desirable to ascertain whether they have reached the Moray Firth with the warm Atlantic water that during western winds rushes through the Pentland Firth, or by travelling along the east coast through the cold Arctic water that wells up from the bottom in the vicinity of the Dogger Bank.

THE programme of the Royal Horticultural Society for the present year includes a daffodil exhibition and conference, to be held at Chiswick on four days of April; the great show in the Temple Gardens in May; an exhibition of tea roses, by the National Rose Society, in June; in July an exhibition of and

conferences upon carnations, ferns, and selaginellas; and in September, at Chiswick, exhibitions of and conferences upon dahlias and grapes. The drill-hall meetings began with one on the subject of winter gardening, introduced by the Rev. W. Wilks; and, after the annual meeting in February, there are to be papers and discussions upon hippeastrums (*amaryllis*), saladings, spring flower gardening, spring flowering shrubs and trees, herbaceous pæonies, lilies, fruit-drying, hollyhocks, crinums, trees and shrubs for large towns, and Chinese primulas. The accommodation at the drill-hall is not adequate to the wants of the Society, and the Council is considering whether it would not be possible to erect a suitable building on the Thames Embankment.

THE International Horticultural Exhibition to be held in Berlin under Royal and Imperial auspices, from April 25 to May 5, will be characterized by two special features—an exhibition of horticultural architecture, and one of horticultural models, apparatus, &c. It is requested that all exhibits or announcements of such should be promptly sent to the General Secretary of the Society for the Promotion of Horticulture, Prof. Dr. L. Wittmack, Invalidenstrasse 42, Berlin N., from whom all further information may be obtained. The Exhibition will be held in the Royal Agricultural Exhibition building, on the Leht Railway. The general organizer of the scientific department is Prof. Dr. Pringsheim; and the following gentlemen have undertaken the management of special branches:—For the geography of plants, Prof. Dr. Ascherson; for physiology, Prof. Dr. Frank; for seeds, Herr P. Hennings; for morphology, anatomy, and the history of development, Prof. Dr. Kny; for fungi, Prof. Dr. Magnus; for soils, Prof. Dr. Orth; for history, literature, and miscellaneous, Dr. Schumann; for officinal and technical objects, Dr. Tschirch. The Minister for Agriculture, Dr. Freiherr v. Lucius-Balhausen, will be the Honorary President of the Exhibition. The city of Berlin has granted the sum of 15,000 marks towards its expenses; and a guarantee fund of 80,000 marks has been raised.

THE Calcutta Herbarium contains a rich collection of Malayan plants, and Dr. King, the superintendent of the Calcutta Royal Botanic Garden, proposes to publish from time to time a systematic account of as many of them as are indigenous to British provinces, or to provinces under British influence. In addition to the States on the mainland of the Malayan peninsula, these provinces include the islands of Singapore and Penang, and the Nicobar and Andaman groups. The classification which Dr. King intends to follow is that of the late Mr. Bentham and Sir Joseph Hooker. The current number of the Journal of the Asiatic Society of Bengal contains the first of this proposed series of papers.

THE January number of the *Kew Bulletin* contains an able and most interesting report, by Dr. Francis Oliver, on the so-called weather plant. This plant is *Abrus precatorius*, Linn., a well-known tropical weed. Mr. Joseph F. Nowack claims to have discovered that its leaves have “the peculiar property of indicating by their position various changes in nature about forty-eight hours before the said changes occur.” Numerous observations with hundreds of such plants have convinced him that “any given position of the leaves corresponds always to a certain condition of the weather forty-eight hours afterwards.” Some time ago he devised an apparatus for the purpose of putting his supposed discovery to practical use. It consists of a “transparent vessel containing the weather plant, closed on all sides, protected against injurious external influences, and adapted to be internally ventilated and maintained at a temperature of at least 18° Reaumur, these being the conditions under which, in temperate climates, Nowack’s weather plant answers the purpose of a weather indicator.” Last year Mr. Nowack was anxious that

his apparatus should be scientifically tested at Kew, but it would not have been easy for any member of the staff of the Royal Gardens to find time for the necessary observations. The task was undertaken by Dr. Francis Oliver, who now presents the results of his investigation. The following is a summary of the conclusions at which he has arrived:—“I contend that all the movements exhibited by the leaves of *Abrus precatorius* depend on causes not so far to seek as those suggested by Mr. Nowack. The ordinary movements of the leaflets, of rising and falling, are called forth in the main by changes in the intensity of the light. In a humid atmosphere they are more sluggish than in a relatively dry one. In other words, when the conditions are favourable for transpiration the movements are most active. The position for snow and hail is connected intimately, in the cases that have come under my observation, with a spotting or biting (by insects) of the leaflets, and is not due to any other external factor. The position for fog and mist, and for electricity in the air, is probably due to the disturbance caused by varying light, the rhythmical movements of the leaflets being temporarily overthrown. The position indicating thunder and lightning I take to be pathological from its tendency to recur on the same leaves. Daily movements of the rachis constitute a periodic function in this as in many other plants with pinnate leaves. The regularity of these oscillations is considerably influenced by both light and temperature.”

ON Tuesday an Archæological Congress began its proceedings at Moscow. The sitting was attended by delegates from German, Austrian, and French Archæological Societies. The section of the Russian Imperial Historical Museum in Moscow allotted to the Moscow Archæological Society was formally opened on January 8, by Prince von Dolgoroukoff, the Governor-General. The collection consists of a variety of antiquities from the Caucasus, stone and glass ornaments, beautiful enamel work from various parts of Russia, ancient holy images, and antique garments and china. A correspondent of the *Times*, who gives an account of the exhibits, calls attention especially to a number of ancient gold ornaments from the Caucasus (described as Merovingian), contributed by the Countess Ouvarova, the President of the Society. He also refers to certain Osetinian copper pins, 18 inches long, found near some human skulls, and supposed to have been used for dressing the hair. A helmet of Assyrian form has attracted much notice.

IN one of the lectures he is delivering at Aberdeen, under the Gifford Bequest, Dr. E. B. Tylor offered a most interesting suggestion the other day as to the meaning of a well-known but puzzling Assyrian sculptured group. This group consists of two four-winged figures, with bodies of men and heads of eagles, standing opposite a tree-like formation, which is easily recognized as a collection of date-palms, or a conventionalized representation of a palm-grove. Each of the two figures carries in the left hand a bucket or basket, in the right a body which each seems to be presenting to the palm-tree. What is this body? It is usually described as a fir-cone, but some have regarded it as a bunch of grapes, others as a pine-apple. Dr. Tylor suggests that it should be connected with the most obvious point of interest for which the date-palm has been famous among naturalists since antiquity—namely, its need of artificial fertilization in order to produce a crop of edible dates. This process in its simplest form consists in shaking the pollen from the inflorescence of the male date-palm over the inflorescence of the female. The practice is mentioned by Theophrastus and Pliny, and in modern times in such works as Shaw’s “Travels in Barbary.” Dr. Tylor exhibited a drawing of the male palm inflorescence, and said it was hardly necessary to point out the resemblance to the object in the hand of the winged figure of the Assyrian sculpture. As the cultivator of the palm-tree has to ascend the tree in order to perform the process of fertilization,

he of course takes with him a supply of fresh flowers in a basket. Dr. Tylor's theory, therefore, is that the objects carried by the winged genii of the Assyrians are the male inflorescence of the date-palm in one hand, the basket with a fresh supply of inflorescence in the other, and that the function the genii are depicted in the sculptures as discharging is that of fertilizing the palm-groves of the country—a function which must have been held to denote their great beneficence, since it showed them fulfilling the great duty of providing the Assyrians with bread.

THE current quarterly statement of the Palestine Exploration Fund contains a brief review of the work done in connection with the Fund during 1889. It is stated that excavations on property belonging to a French gentleman on the eastern slope of Zion have revealed a number of rock-hewn chambers, which appear to have been used in ancient times partly as dwellings and partly as storehouses. In describing them Herr Schick remarks that nearly all the ground covered by the city of Jerusalem is found on examination to be honeycombed with these rock-hewn chambers. It is not improbable that the Jebusites were to some extent troglodytes. In the Apocryphal Acts of the Apostles mention is made of a cave at Cyprus "where the race of the Jebusites formerly dwelt."

SEVERAL violent shocks of earthquake occurred in Carinthia on January 14, at 9.30 p.m., their direction being from south-east to north-west. In the theatre at Klagenfurt, which was densely packed, the seismic disturbance caused a panic, which was heightened by a false alarm of fire. The audience, however, soon became reassured, and there was no accident to life or limb.

THE Pilot Chart of the North Atlantic Ocean for the month of January states that December was notable for the severe storms that prevailed along the Transatlantic routes. A number of the depressions followed each other in rapid succession; the most notable of these was one on the 16th, in about lat. 51° N., long. 37° W. Gales of hurricane force, with mountainous seas, accompanied this disturbance, as it moved to the north-eastward, to the serious embarrassment of west-bound steamers. Two storms occurred to the eastward of Bermuda during the first week of the month. The first of these disturbances was central on the 4th, in about lat. 36° N., long. 55° W. After 16 hours the wind hauled to south-east and moderated. The south-east wind experienced after the passage of the storm was probably due to the approach of the second cyclone, which was central on the 5th in about lat. 31° N., long. 63° W., and was accompanied by severe hailstorms and heavy seas. Very little fog was reported. A dense fog along the coast of the United States on the 19th, 20th, and 21st, extended some distance inland; navigation in New York harbour was practically suspended on the 20th. Ocean ice was reported in the neighbourhood of lat. 48° N., long. 47° W.

WE referred lately to a new kind of butter which is now being made in Germany from cocoanut milk. The Calcutta Correspondent of the *Times* says that the cocoanuts required for this industry are imported in large numbers from India, chiefly Bombay, and that the trade seems likely to attain still greater importance.

ACCORDING to the *Perseveranza* of Milan, quoted in the current number of the *Board of Trade Journal*, important sponge-banks have lately been discovered close to the island of Lampedusa, on the southern coast of Sicily. These deposits of sponges extend for over a surface of from 15 to 18 marine leagues, and are situated about an equal distance from the south-eastern extremity of the island. The smallest depth above these banks is 20 ells; the greatest depth is from 30 to 31 ells. At the lesser depths rock is met with, on which the sponge grows; at greater depths a sandy soil is found. All varieties of sponge

are discovered here, including those which are in the greatest commercial request, and they are easy to obtain. Greek and Italian vessels have already proceeded to Lampedusa to take advantage of this discovery.

AT the meeting of the Linnean Society of New South Wales, on November 27, Mr. K. H. Bennett read a paper on the breeding of the glossy ibis (*Ibis falcinellus*, Linn.). The unprecedented rainfall of the year on the Lower Lachlan induced several species of birds to breed in the district, contrary to the author's experience of previous years. Among these was the glossy ibis, two nests of which with eggs of a beautiful greenish-blue colour somewhat resembling those of *Ardea novae-hollandiae*, but much brighter, were found in October and November. At the same meeting Mr. J. H. Maiden communicated preliminary notes, by Dr. T. L. Bancroft, on the pharmacology of some new poisonous plants. Mr. T. P. Lucas read a paper on Queensland Macro-Lepidoptera, with localities and descriptions of new species. Forty-one species belonging to various families were proposed as new, and new localities were given for about ninety-five other species.

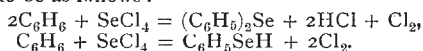
THE new number of "The Year Book of Pharmacy" (J. and A. Churchill) has been issued. It comprises abstracts of papers relating to pharmacy, materia medica, and chemistry, contributed by British and foreign journals from July 1, 1888, to June 30, 1889. It presents also the Transactions of the British Pharmaceutical Conference at the twenty-sixth annual meeting, held at Newcastle-on-Tyne, September 1889.

MESSRS. E. AND F. N. SPON have issued a third edition of "A Guide for the Electric Testing of Telegraph Cables," by Colonel V. Hoskiær, of the Royal Danish Engineers. The first edition appeared in 1873. The Congress of Electricians in 1881 made some alterations necessary, and the author explains that he has added a few methods of testing, in the hope of making the book more useful.

THE Society for Promoting Christian Knowledge has issued, in the series entitled "Chief Ancient Philosophies," a third edition of the Rev. I. Gregory Smith's "Aristotelianism," in which an attempt is made to tabulate from the "Ethics" the opinions of Aristotle on questions relating to what has been called "the scientific basis of morality." In the same volume is printed a treatise, by the Rev. W. Grundy, Head Master of Malvern College, on the more important of Aristotle's other works.

SOME interesting properties and reactions of the chlorides of selenium are described by M. Chabré in the current number of the *Bulletin de la Société Chimique de Paris*. Selenium tetrachloride, SeCl_4 , was obtained by Berzelius by passing a stream of chlorine over selenium at the ordinary temperature, a quantity of the reddish-brown liquid subchloride, Se_2Cl_2 , being first formed, and eventually converted to the pale yellow solid tetrachloride. The tetrachloride was subsequently volatilized by heating and obtained in small white opaque crystals. By heating the crystals obtained by this method in one end of a sealed tube to 190° – 200° C., M. Chabré has obtained a sublimate of much larger and better formed crystals, presenting brilliant faces. With these crystals determinations of the vapour density of the tetrachloride were attempted by Victor Meyer's method at 360° in an atmosphere of nitrogen. The resulting numbers show that two molecules of SeCl_4 dissociate at 360° into one molecule of Se_2Cl_2 and three molecules of chlorine. The subchloride, Se_2Cl_2 , is a very much more stable body, and may be distilled unchanged at 360° . Determinations of the density of its vapour yield values closely approximating to 7.95, the theoretical density of a molecule of the formula Se_2Cl_2 . Among the numerous reactions of these compounds which M. Chabré has studied, the most interesting are those between selenium tetrachloride and

benzene. It is curious that when pure benzene is allowed to react upon pure SeCl_4 , the latter body undergoes precisely the same decomposition as when heated to 360° , the liberated chlorine reacting with the benzene to form several chlorobenzenes and all the selenium remaining in the form of Se_2Cl_2 . If, however, the benzene and selenium tetrachloride are brought together in presence of that most useful of intermediate reagents, aluminium chloride, quite a different series of changes occur. On treating the mixture with water, and separating and distilling the oil obtained, three distinct fractions may be collected. The first, which passes over at 131° – 133° , consists of monochlor benzene, $\text{C}_6\text{H}_5\text{Cl}$. The second, distilling at 227° – 228° under a pressure of only a few millimetres of mercury, consists of phenyl selenide, $(\text{C}_6\text{H}_5)_2\text{Se}$, corresponding to phenyl sulphide, $(\text{C}_6\text{H}_5)_2\text{S}$, and phenyl oxide, $(\text{C}_6\text{H}_5)_2\text{O}$. It is a yellow oil of sp. gr. 1.45 at 19°C . The third fraction, boiling between 245° and 250° under the same reduced pressure, consists of another new compound of the composition $\text{Se}_2(\text{C}_6\text{H}_5)_3\text{C}_6\text{H}_4\text{Cl}$. This substance is a red oil of sp. gr. 1.55 at 19°C . On allowing this red oil to stand it deposits yellow crystals of a compound of powerful odour, which may be obtained recrystallized from alcohol in long rhombic prisms. On analysis this substance turns out to be seleno-phenol, $\text{C}_6\text{H}_5\text{SeH}$, analogous to thiophenol and mercaptan, both of evil odour. Like all the hitherto investigated mercaptans, its alcoholic solution readily reacts with salts of mercury and silver. Analysis of the silver salt leads to the formula $\text{C}_6\text{H}_5\text{SeAg}$. The reactions by which phenyl selenide and seleno-phenol are respectively produced are believed by M. Chabrie to be as follows:—



THE additions to the Zoological Society's Gardens during the past week include a Black-headed Gull (*Larus ridibundus*), British, presented by Mr. E. Hart, F.Z.S.; a Chinese Jay Thrush (*Garrulax chinensis*) from China, presented by Sir Harry B. Lumsden, C.B., K.C.S.I., F.Z.S.; a King Parakeet (*Aprosmictus scapulatus* ♂) from Australia, presented by the Rev. A. J. P. Matthews, F.L.S.; a Peregrine Falcon (*Falco peregrinus*) from Scotland, presented by Mr. Geo. W. Landels; a Vulturine Eagle (*Aquila verreauxi*), a Jackal Buzzard (*Buteo jacob*), a White-necked Raven (*Corvus albus*) from South Africa, presented by Mr. Marshall; a Pigmy Cormorant (*Phalacrocorax africanus*), a Moorhen (*Gallinula chloropus*), two Shining Weaver Birds (*Hypochaeris nitens*), four Black-bellied Weaver Birds (*Euplectes afer* 2 ♂ 2 ♀), two Abyssinian Weaver Birds (*Ploceus abyssinicus* ♂ ♂), four Red-beaked Weaver Birds (*Quelea sanguinirostris* 2 ♂ 2 ♀), four Cutthroat Finches (*Amadina fasciata* 2 ♂ 2 ♀), four Orange-cheeked Waxbills (*Estrela melpoda*), a Paradise Whydah Bird (*Vidua paradisica* ♂) from West Africa, an Indian Silver-Bill (*Munia malabarica*) from India, two Cardinal Grosbeaks (*Cardinalis virginianus* ♂ ♂) an Indigo Bird (*Cyanospiza cyanea* ♂) from North America, purchased.

OUR ASTRONOMICAL COLUMN.

OBJECTS FOR THE SPECTROSCOPE.

Sidereal Time at Greenwich at 10 p.m. on January 23 = 6h 12m. 44s.

Name.	Mag.	Colour.	R.A. 1890.	Decl. 1890.
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(2) L.L. 12169	7	Yellowish-red.	6 15 58	— 11 46
(3) ♂ Canis Maj.	5	Yellow.	6 48 38	— 11 53
(4) γ Geminorum	2	White.	6 31 24	+ 16 30
(5) 74 Schj.	6	Reddish-yellow.	6 19 12	+ 14 46
(6) U Cancri	Var.	Reddish.	8 29 28	+ 19 16
(7) R Draconis	Var.	Yellowish-red.	16 32 22	+ 66 59

Remarks.

(1) The General Catalogue description of this nebula is as follows: "Planetary nebula; pretty bright, very small, very little extended." So far as I know, the spectrum has not yet been recorded, but if it is of the same nature as other planetary nebulae, bright lines may be expected. The character of the chief line, near λ 500, if visible, should be particularly noted.

(2) Dunér classes this with stars of Group II., but states that the type of spectrum is a little uncertain. He notes, however, that the bands 2, 3, and 7 are visible, so there seems to be no reasonable doubt about the type. The probability is that it is either an early or late star of the group, in which case we should not expect to find all the bands fully developed. The star has been provisionally placed in species 2 of the subdivision of the group, but further observations are at once suggested to determine whether this is right or wrong. If right, the bright flutings of carbon should be fairly prominent, as it is probably due to the masking effects of these flutings that some of the dark bands are absent. The carbon flutings near 517 and 474, seen in the spectrum of a bunsen or spirit-lamp flame, should therefore be particularly looked for. It is possible, too, that in the earlier stars of the group the hydrogen lines may appear bright, as the swarms are only a little more condensed than those constituting stars with bright lines, so that the interspatial radiation may more than balance the absorption.

(3) According to the observations of Konkoly, this is a good example of stars of the solar type. The usual observations, as to whether the star belongs to Group III. or to Group V., are required.

(4) A star of Group IV. (Gothard). The main point to be noted in stars of this class is the relative intensities of the lines of hydrogen and those of iron, magnesium, and sodium, for the purpose of arranging them in a line of temperature. If possible, the criterion lines which indicate increasing or decreasing temperature should also be noted, as in the stars which have hitherto been classed as of the solar type.

(5) This is a star of Group VI., showing the usual carbon flutings and the subsidiary bands 4 and 5 (Dunér). In some stars of the group of smaller magnitude, a greater number of secondary bands have been noted, and it seems possible, therefore, that 74 Schj. may not have been observed under the most favourable conditions. Further confirmatory observations are therefore necessary before conclusions as to the specific differences between the different stars of the group can safely be drawn.

(6) The spectrum of this variable has not yet been recorded. The period is 305.7 days, and the range from 8.2–10.6 at maximum to < 13 at minimum (Gore). The maximum occurs on January 23.

(7) This variable star has a period of 244.5 days, and ranges from 7–8.7 at maximum to < 13 at minimum. The spectrum is of the Group II. type, and the range of variability is such that the appearance of bright lines at maximum may be expected, as in R Leonis, &c., observed by Mr. Espin. The maximum occurs on January 25. A. FOWLER.

THE CLUSTER G.C. 1420 AND THE NEBULA N.G.C. 2237. —Dr. Lewis Swift, in the *Sidereal Messenger* for January 1890, calls attention to a wonderful nebulous ring entirely surrounding this cluster. The ring was discovered by Prof. Barnard last year (*Astr. Nach.*, 2918), and its average outer diameter estimated as not less than 40', so that in comparison the ring nebula in Lyra is a pygmy. Although Dr. Swift discovered, in 1865, a large diffused nebula north-preceding the star-cluster G.C. 1420, his attention was first directed to the ring structure by Prof. Barnard in January 1889.

The nebula N.G.C. 2237 is in the constellation Monoceros; its position is R.A. 6h. 24m. 48s., Decl. + $5^\circ 8'$; hence it will soon be favourably situated for observation, and Dr. Swift hopes that Mr. Isaac Roberts will be induced to photograph it, as a change both in brightness and form is suspected.

ON THE SPECTRUM OF ζ URSAE MAJORIS. —An examination of seventy photographs of the spectrum of this star, taken on as many different nights at Harvard College, and beginning on March 27, 1887, has led Prof. Pickering to conclude that the K line is double at intervals of 52 days, and that, for several days before and after it is seen to be double in the photographs, it presents a hazy appearance. From the period assigned, it was predicted that the line should be double on December 8, 1889, and January 30, 1890, and the duplicity